T00102

USE OF SDI TOTAL BTEX/TPH RaPID ASSAY® KITS FOR SEMI-QUANTITATIVE SCREENING CONSISTENT WITH SW-846 METHOD 4030

BACKGROUND

The Methods Section of the EPA Office of Solid Waste (OSW) has stated a need for more rapid, less expensive field screening procedures that do not compromise the accuracy of contaminant evaluation. The OSW screening approach incorporates a single point threshold or multiple individual point discriminators giving results in semi-quantitative ranges lying between these points. SDI has validated all of the RaPID Assays using a calibration curve to convert an absorbance response to a numerical value. The performance data provided in the package insert reflects this method of data interpretation. Alternate approaches are required by OSW for SW-846 screening applications of the technology. In keeping with the OSW screening method program requirements, those applications of SDI products to projects that require SW-846 methods must be formatted according to these OSW guidelines.

USE OF A SITE SAMPLE TO DETERMINE SCREENING THRESHOLD

The most accurate approach to calibration of an immunoassay screening test for TPH contamination is to utilize a known amount of the contaminant itself, taken from the project site, to define the threshold. A site sample with a pre-determined SW-846 approved method quantitative result (e.g., Method 8015 or 8440) is diluted to the appropriate threshold concentration and results of unknowns are then directly compared to the diluted site sample without further unit correction.

CORRECTING CALIBRATOR LEVELS FOR REACTIVITY, EXTRACTION EFFICIENCY AND ANALYTICAL CONFIDENCE

The RaPID Assay Environmental User's Guide describes factors that affect the Total BTEX/TPH RaPID Assay system immunoassay result. This information should be considered when interpreting results from a particular remediation project. The Total BTEX/TPH RaPID Assay Kit provides standard calibrators in terms of a mixture containing equal parts of benzene, toluene, ethylbenzene and the three xylene isomers.

METHOD 4030 PROCEDURE for TPH

1. Follow the instructions given in the RaPID Assay and RaPID Prep package inserts for preparation of kit reagents and samples.
2. Set up an immunoassay run with a zero calibrator and three calibrators and a control as follows:

Tube Number	Contents of Tube
1	Zero standard, 0 ppb
2	Standard 1, 0.09 ppm
3	Standard 2, 0.35 ppm
4	Standard 3, 3.0 ppm
5	Control
6	Sample 1
7	Sample 2
8	Sample 3

Note: Performing the assay in duplicate improves the accuracy of the test results.

3. Follow the assay procedure given in the kit package insert. Make absorbance readings at 450 nm with the RPA-III or the RPA-I spectrophotometer. For the RPA-I select the "Read Absorbance" mode under listed under the "Special Functions" menu.

INTERPRETATION OF RESULTS

1. Obtain an absorbance (O.D.) reading for each tube.
2. Perform a quality control check on your data to ensure the following:
   - ☑ The absorbance readings of the standards should be in descending order: standard #1 O.D. > standard #2 O.D.> standard #3 O.D.
   - ☑ The control tube should have an O.D. reading that falls between standard #2 and standard #3.
3. ***Apply correction factors to the standards as needed to adjust their values for a particular project***. See *Detection of Petroleum Hydrocarbons Using RaPID Assays* for discussion of these factors and Total BTEX/TPH RaPID Assay characteristics. The reactivity of certain fuel types has been characterized directly with the RaPID Prep Sample Extraction Kit and the Total BTEX/TPH RaPID Assay as shown in the following table. Results are given as Total Fuel in soil (ppm).

FUEL	STD 1	STD 2	STD 3
gasoline	10	50	500
home heating oil	20	70	600
JP-4	20	80	750
diesel fuel	10	40	300
jet A fuel	200	500	2500

4. Interpret the sample O.D. results with reference to the readings of the standard tubes.

EXAMPLE

Three soil samples were extracted and tested using the procedures described in the Total BTEX/TPH Sample Extraction Kit. The soil was taken from a site contaminated with JP-4. The results were interpreted as follows:

	O.D.450	QC check
Zero standard	1.25	
Std 1	0.95	☑
Std 2	0.72	☑
Std 3	0.30	☑
Control	0.55	☑
Sample 1	1.03	
Sample 2	0.86	
Sample 3	0.22	

Sample	Assay Result	Interpretation	
	O.D.450	**O.D.450 Ranking**	**Total Fuel as JP-4 in Soil**
sample 1	1.03	greater than std 1	less than 20 ppm
sample 2	0.86	between std 1 and std 2	between 20 and 80 ppm
sample 3	0.22	less than std 3	more than 750 ppm

REFERENCES

Detection of Petroleum Hydrocarbons Using RaPID Assays
RaPID Assay Environmental User's Guide
Total BTEX/TPH RaPID Assay package insert
Total BTEX/TPH RaPID Prep package insert

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